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The small-angle scattering instrument SANS-1 at MLZ

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We present the developments and improvements of the SANS-1 instrument, a joint TUM and Hereon project [1] since the first user experiments in 2012. The classical pinhole SANS-1 features now two velocity selectors and an ultra-fast TISANE chopper, efficiently allowing to tune flux, resolution, duty cycle and frame overlap, including time resolved measurements with repetition rates up to 10 kHz.

The signal to noise ratio has been significantly improved by upgrading the collimation line with new compound apertures. A second key feature is the large accessible Q -range facilitated by the sideways movement of the primary 1m^2 detector. Particular attention is hence paid to effects like tube shadowing and anisotropic solid angle corrections that arise due to large scattering angles on an array of single ^3He tubes, where a standard solid angle correction is no longer valid.

SANS-1 also features now a sample stage equipped with a heavy-duty 1-ton goniometer, allowing hosting a wide range of different sample environment like a set of sample changers, magnets, ovens, a bespoke dilatometer for in-situ rapid quenching/heating and stress analysis [2] and a dedicated HF-coil system for nanomagnetic hyperthermia [3]. We present a wide range of adapted sample environments, like a high T furnace that works as an insert for the 2.5T magnet, a future high field magnet and a pressure cell for GISANS. We also present the upgrade plans for a second detector array and a changed guide concept for a massive Q -range extension.

[1] S. Mühlbauer et al., NIMA 832, 297-305, (2016)

[2] TA Instruments, DIL805A/D/T Quenching dilatometer

[3] NB Nanoscale, D5 HF-Generator for Magnetic Hyperthermie

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